DRINKING WATER SURVEILLANCE PROGRAM

DUNNVILLE WATER TREATMENT PLANT

ANNUAL REPORT 1990

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DRINKING WATER SURVEILLANCE PROGRAM

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

DUNNVILLE WATER TREATMENT PLANT
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Dunnville water treatment plant is a conventional treatment plant which treats water from Lake Erie. The process consists of coagulation, flocculation, sedimentation, filtration and disinfection. Potassium permanganate is added for taste and odour control when needed. The Dunnville water treatment plant serves a population of approximately 11,300.

Water at the plant and at one location in the distribution system was sampled for the presence of approximately 180 parameter. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Dunnville water treatment plant, for the sample year 1990, produced good quality water and this quality was maintained in the distribution system.

93-02450/

TABLE A
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	RAW SITE			TREATED			SITE 1		
	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	12	0	0	4	1	25	2	0	0
CHEMISTRY (FLD)	23	23	100	24	24	100	16	16	100
CHEMISTRY (LAB)	88	73	82	88	64	72	57	46	80
METALS	96	38	39	96	33	34	69	25	36
CHLOROAROMATICS	56	0	0	56	0	0	28	0	0
CHLOROPHENOLS	6	0	0	6	0	0	.	.	.
PAH	68	0	0	51	0	0	17	0	0
PESTICIDES & PCB	137	0	0	137	0	0	43	0	0
PHENOLICS	4	1	25	4	0	0	.	.	.
SPECIFIC PESTICIDES	28	0	0	28	0	0	2	0	0
VOLATILES	116	16	13	116	16	13	58	8	13
TOTAL	634	151		610	138		292	95	

DRINKING WATER SURVEILLANCE PROGRAM

DUNNVILLE WATER TREATMENT PLANT
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Dunnville water treatment plant in September 1990. This is the first annual report.

PLANT DESCRIPTION

The Dunnville water treatment plant is a conventional treatment plant which treats water from Lake Erie. The Dunnville industrial lowlift pumping station uses microstrainers, then chlorinates the raw water and supplies industries at Port Maitland. This water is also transmitted 7 Km to the town of Dunnville for complete treatment. The process consists of coagulation, flocculation, sedimentation, filtration, and disinfection. Potassium permanganate is added for taste and odour control when needed. The Dunnville water treatment plant serves a population of approximately 11,300.

The sample day flows ranged from 3.465 x 1000 m^3/day to 4.545 x 1000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to

make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the

method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count was the only bacteriological analysis conducted on the treated and distributed water. No results were reported above the guideline.

INORGANIC & PHYSICAL

CHEMISTRY (FLD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and

corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 3 of 6 treated and distributed water samples with a maximum reported value of 21.0°C.

CHEMISTRY (LAB)

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in 6 of 6 treated and distributed water samples with a maximum reported value of 139.8 mg/L.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 2 of 6 treated and distributed water samples with a maximum reported value of 140.0 ug/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected above trace levels.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the pesticides and PCB scan showed that none were detected above trace levels.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results were reported above trace levels.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 6 treated and distributed water samples analyzed with a maximum level of 41.9 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

Trihalomethanes were reported in all plant raw water samples because the water had already been chlorinated at the Dunnville Industrial pumping station.

CONCLUSIONS

The Dunnville water treatment plant, for the sample year 1990, produced good quality water and this quality was maintained in the distribution system.

No known health related guidelines were exceeded.

Additional DWSP sampling of the unchlorinated raw water at the Dunnville Industrial lowlift pumping station will begin in 1991.

FIGURE 1

DUNNVILLE WTP

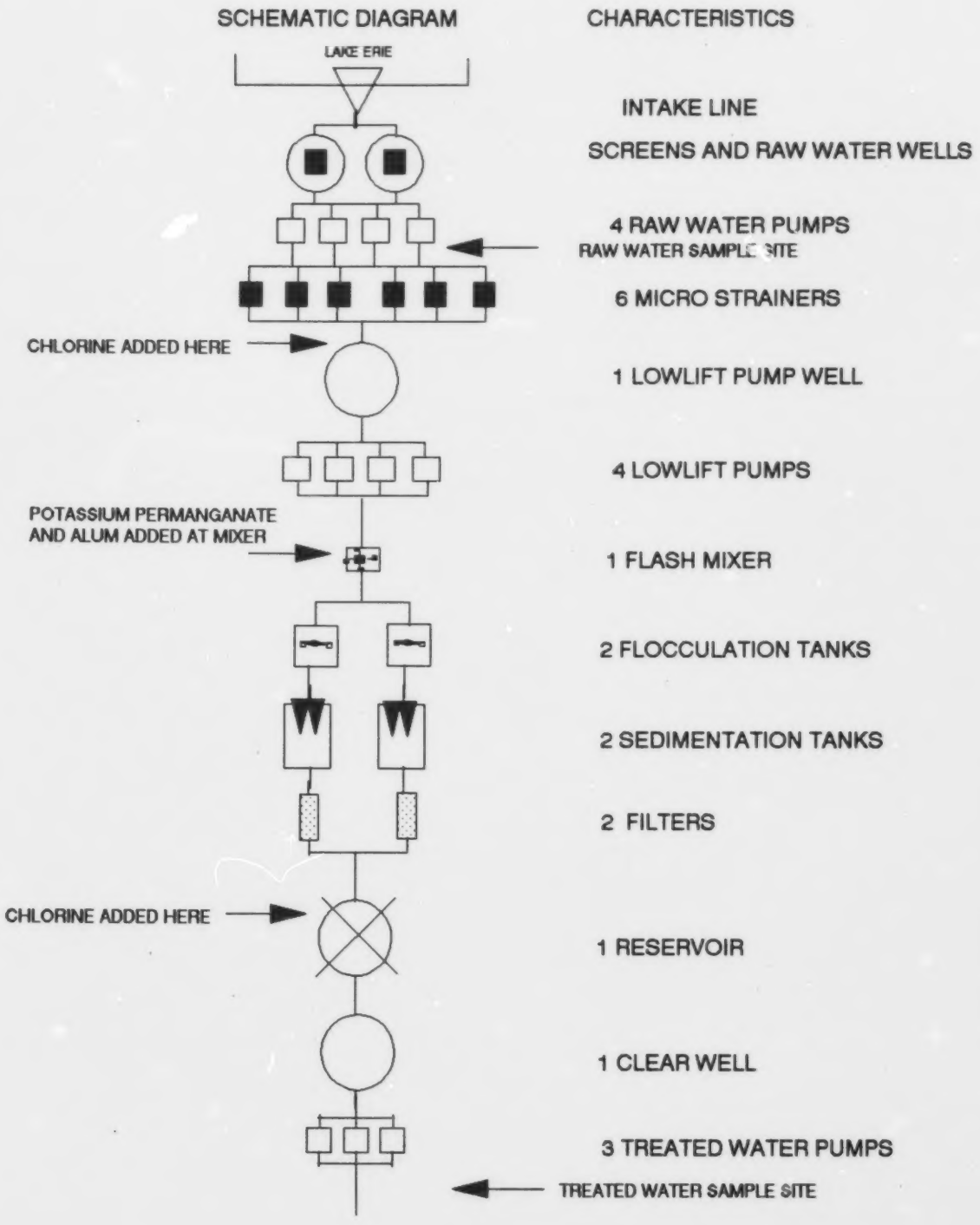

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 220003555
PLANT NAME: DUNNVILLE WTP

DISTRICT: HALDIMAND-NORFOLK
REGION: WEST CENTRAL
DISTRICT OFFICER :J. VOGT

UTM #:

PLANT SUPERINTENDENT: RON BARRY

ADDRESS: 112 MAIN ST E
DUNNVILLE,ONTARIO
N1A 1J9
(416-774-7111)

MUNICIPALITY: HALDIMAND-NORFOLK
AUTHORITY: MUNICIPAL

PLANT INFORMATION

PLANT VOLUME:	-	(X 1000 M3)
DESIGN CAPACITY:	13.6	(X 1000 M3/DAY)
RATED CAPACITY:	-	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
DUNNVILLE	11,300

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
FREE CHLORINE RESIDUAL	HIGHLIFT DISCHARGE	CONTINUOUS
	RAW WATER	DAILY
	TREATED WATER	DAILY
PH	RAW WATER	DAILY
	TREATED WATER	DAILY
TURBIDITY	HIGHLIFT DISCHARGE	CONTINUOUS
	RAW WATER	DAILY
	TREATED WATER	DAILY

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGE (MG/L)	
			POST CHLORINATION	COAGULATION
DATE	DELAY * TIME(HRS)	FLOW (1000M3)	CHLORINE	ALUM LIQUID
OCT 09	6.00	3.636	.65	10.67
NOV 13	4.00	4.545	.71	14.70
DEC 11	4.00	3.465	4.70	45.29

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL									
FECAL COLIFORM MF	4	0	0	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	4	1	0	2	0	0
TOTAL COLIFORM MF	4	0	0	.	.	.	.	.	.
T COLIFORM BCKGRD MF	4	0	0	.	.	.	.	.	.
*TOTAL SCAN BACTERIOLOGICAL	12	0	0	4	1	0	2	0	0
CHEMISTRY (FLD)									
FLD CHLORINE (COMB)	3	3	0	4	4	0	3	3	0
FLD CHLORINE FREE	4	4	0	4	4	0	3	3	0
FLD CHLORINE (TOTAL)	4	4	0	4	4	0	3	3	0
FLD PH	4	4	0	4	4	0	3	3	0
FLD TEMPERATURE	4	4	0	4	4	0	3	3	0
FLD TURBIDITY	4	4	0	4	4	0	1	1	0
*TOTAL SCAN CHEMISTRY (FLD)	23	23	0	24	24	0	16	16	0
CHEMISTRY (LAB)									
ALKALINITY	4	4	0	4	4	0	3	3	0
CALCIUM	4	4	0	4	4	0	3	3	0
CYANIDE	4	0	0	4	0	0	.	.	.
CHLORIDE	4	4	0	4	4	0	3	3	0
COLOUR	4	0	3	4	0	3	3	0	3
CONDUCTIVITY	4	4	0	4	4	0	3	3	0
DISS ORG CARBON	4	4	0	4	4	0	3	3	0
FLUORIDE	4	4	0	4	4	0	3	3	0
HARDNESS	4	4	0	4	4	0	3	3	0
IONCAL	4	4	0	4	4	0	3	3	0
LANGELIERS INDEX	4	4	0	4	4	0	3	3	0
MAGNESIUM	4	4	0	4	4	0	3	3	0
SODIUM	4	4	0	4	4	0	3	3	0
AMMONIUM TOTAL	4	0	1	4	1	1	3	0	2
NITRITE	4	2	1	4	0	2	3	0	1
TOTAL NITRATES	4	4	0	4	4	0	3	3	0
NITROGEN TOT KJELD	4	4	0	4	4	0	3	1	2
PH	4	4	0	4	4	0	3	3	0
PHOSPHORUS FIL REACT	4	4	0	4	0	1	.	.	.
PHOSPHORUS TOTAL	4	3	1	4	0	2	.	.	.
SULPHATE	4	4	0	4	4	0	3	3	0
TURBIDITY	4	4	0	4	3	1	3	3	0
*TOTAL SCAN CHEMISTRY (LAB)	88	73	6	88	64	10	57	46	8

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS									
SILVER	4	0	0	4	0	0	3	0	0
ALUMINUM	4	4	0	4	4	0	3	3	0
ARSENIC	4	0	4	4	0	3	3	0	1
BARIUM	4	4	0	4	4	0	3	3	0
BORON	4	4	0	4	4	0	3	3	0
BERYLLIUM	4	0	0	4	0	0	3	0	1
CADMIUM	4	0	1	4	0	0	3	0	0
COBALT	4	0	4	4	0	3	3	0	2
CHROMIUM	4	0	4	4	0	4	3	0	3
COPPER	4	0	4	4	0	4	3	0	3
IRON	4	2	2	4	0	1	3	0	2
MERCURY	4	0	1	4	0	2	.	.	.
MANGANESE	4	4	0	4	4	0	3	3	0
MOLYBDENUM	4	4	0	4	4	0	3	3	0
NICKEL	4	0	3	4	0	2	3	0	0
LEAD	4	2	2	4	0	2	3	0	3
ANTIMONY	4	2	2	4	3	1	3	2	1
SELENIUM	4	0	4	4	0	2	3	0	3
STRONTIUM	4	4	0	4	4	0	3	3	0
TITANIUM	4	2	2	4	0	4	3	0	3
THALLIUM	4	0	0	4	0	0	3	0	0
URANIUM	4	0	4	4	0	4	3	0	3
VANADIUM	4	2	2	4	4	0	3	3	0
ZINC	4	4	0	4	2	2	3	2	1
*TOTAL SCAN METALS	96	38	39	96	33	34	69	25	26
*TOTAL GROUP INORGANIC & PHYSICAL	207	134	45	208	121	44	142	87	34
CHLOROAROMATICS									
HEXACHLOROBUTADIENE	4	0	0	4	0	0	2	0	0
123 TRICHLOROBENZENE	4	0	0	4	0	0	2	0	0
1234 T-CHLOROBENZENE	4	0	0	4	0	0	2	0	0
1235 T-CHLOROBENZENE	4	0	0	4	0	0	2	0	0
124 TRICHLOROBENZENE	4	0	0	4	0	0	2	0	0
1245 T-CHLOROBENZENE	4	0	0	4	0	0	2	0	0
135 TRICHLOROBENZENE	4	0	0	4	0	0	2	0	0
HCB	4	0	0	4	0	0	2	0	0
HEXACHLOROETHANE	4	0	0	4	0	1	2	0	1
OCTACHLOROSTYRENE	4	0	0	4	0	0	2	0	0
PENTACHLOROBENZENE	4	0	0	4	0	0	2	0	0
236 TRICHLOROTOLUENE	4	0	0	4	0	0	2	0	0
245 TRICHLOROTOLUENE	4	0	0	4	0	0	2	0	0
26A TRICHLOROTOLUENE	4	0	0	4	0	0	2	0	0
*TOTAL SCAN CHLOROAROMATICS	56	0	0	56	0	1	28	0	1

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROPHENOLS									
234 TRICHLOROPHENOL	1	0	0	1	0	0	.	.	.
2345 T-CHLOROPHENOL	1	0	0	1	0	0	.	.	.
2356 T-CHLOROPHENOL	1	0	0	1	0	0	.	.	.
245-TRICHLOROPHENOL	1	0	0	1	0	0	.	.	.
246-TRICHLOROPHENOL	1	0	0	1	0	0	.	.	.
PENTACHLOROPHENOL	1	0	0	1	0	0	.	.	.
*TOTAL SCAN CHLOROPHENOLS	6	0	0	6	0	0	0	0	0
PAH									
PHENANTHRENE	4	0	0	3	0	0	1	0	0
ANTHRACENE	4	0	0	3	0	0	1	0	0
FLUORANTHENE	4	0	0	3	0	0	1	0	0
PYRENE	4	0	0	3	0	0	1	0	0
BENZO(A)ANTHRACENE	4	0	0	3	0	0	1	0	0
CHRYSENE	4	0	0	3	0	0	1	0	0
DIMETH. BENZ(A)ANTHR	4	0	0	3	0	0	1	0	0
BENZO(E) PYRENE	4	0	0	3	0	0	1	0	0
BENZO(B) FLUORANTHEN	4	0	0	3	0	0	1	0	0
PERYLENE	4	0	0	3	0	0	1	0	0
BENZO(K) FLUORANTHEN	4	0	0	3	0	0	1	0	0
BENZO(A) PYRENE	4	0	0	3	0	0	1	0	0
BENZO(G,H,I) PERYLEN	4	0	0	3	0	0	1	0	0
DIBENZO(A,H) ANTHRAC	4	0	0	3	0	0	1	0	0
INDENO(1,2,3-C,D) PY	4	0	0	3	0	0	1	0	0
BENZO(B) CHRYSENE	4	0	0	3	0	0	1	0	0
CORONENE	4	0	0	3	0	0	1	0	0
*TOTAL SCAN PAH	68	0	0	51	0	0	17	0	0
PESTICIDES & PCB									
ALDRIN	4	0	0	4	0	0	2	0	0
ALPHA BHC	4	0	2	4	0	2	2	0	1
BETA BHC	4	0	0	4	0	0	2	0	0
LINDANE	4	0	0	4	0	0	2	0	0
ALPHA CHLORDANE	4	0	0	4	0	0	2	0	0
GAMMA CHLORDANE	4	0	0	4	0	0	2	0	0
DIELDRIN	4	0	0	4	0	0	2	0	0
METHOXYCHLOR	4	0	0	4	0	0	2	0	0
ENDOSULFAN 1	4	0	0	4	0	0	2	0	0
ENDOSULFAN II	4	0	0	4	0	0	2	0	0
ENDRIN	4	0	0	4	0	0	2	0	0
ENDOSULFAN SULPHATE	4	0	0	4	0	0	2	0	0
HEPTACHLOR EPOXIDE	4	0	0	4	0	0	2	0	0
HEPTACHLOR	4	0	0	4	0	0	2	0	0
MIREX	4	0	0	4	0	0	2	0	0
OXYCHLORDANE	4	0	0	4	0	0	2	0	0
OPDDT	4	0	0	4	0	0	2	0	0
PCB	4	0	0	4	0	0	2	0	0
DDD	4	0	0	4	0	0	2	0	0
PPDDE	4	0	0	4	0	0	2	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	4	0	0	4	0	0	2	0	0
AMETRINE	4	0	0	4	0	0	.	.	.
ATRAZINE	4	0	2	4	0	2	.	.	.
ATRATONE	4	0	0	4	0	0	.	.	.
CYANAZINE (BLADEX)	4	0	0	4	0	0	.	.	.
DESETHYLATRAZINE	4	0	0	4	0	0	.	.	.
D-ETHYL SIMAZINE	3	0	0	3	0	0	.	.	.
PROMETONE	4	0	0	4	0	0	.	.	.
PROPAZINE	4	0	0	4	0	0	.	.	.
PROMETRYNE	4	0	0	4	0	0	.	.	.
METRIBUZIN (SENCOR)	3	0	0	3	0	0	.	.	.
SIMAZINE	4	0	0	4	0	0	.	.	.
ALACHLOR (LASSO)	4	0	0	4	0	0	.	.	.
METOLACHLOR	4	0	0	4	0	0	.	.	.
HEXACLCYCLOPENTADIEN	3	0	0	3	0	0	1	0	0
*TOTAL SCAN PESTICIDES & PCB	137	0	4	137	0	4	43	0	1
PHENOLICS									
PHENOLICS	4	1	1	4	0	2	.	.	.
*TOTAL SCAN PHENOLICS	4	1	1	4	0	2	0	0	0
SPECIFIC PESTICIDES									
TOXAPHENE	4	0	0	4	0	0	2	0	0
2,4,5-T	1	0	0	1	0	0	.	.	.
2,4-D	0	0	0	0	0	0	.	.	.
2,4-DB	1	0	0	1	0	0	.	.	.
2,4 D PROPIONIC ACID	1	0	0	1	0	0	.	.	.
DICAMBA	0	0	0	0	0	0	.	.	.
PICHLORAM	0	0	0	0	0	0	.	.	.
SILVEX	1	0	0	1	0	0	.	.	.
DIAZINON	1	0	0	1	0	0	.	.	.
DICHLOROVOS	1	0	0	1	0	0	.	.	.
CHLORPYRIFOS	1	0	0	1	0	0	.	.	.
ETHION	1	0	0	1	0	0	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.
MALATHION	1	0	0	1	0	0	.	.	.
MEVINPHOS	1	0	0	1	0	0	.	.	.
METHYL PARATHION	1	0	0	1	0	0	.	.	.
METHYLTRITHION	1	0	0	1	0	0	.	.	.
PARATHION	1	0	0	1	0	0	.	.	.
PHORATE	1	0	0	1	0	0	.	.	.
RELDAN	1	0	0	1	0	0	.	.	.
RONNEL	1	0	0	1	0	0	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.
BENOMYL	0	0	0	0	0	0	.	.	.
BUX	0	0	0	0	0	0	.	.	.
CARBOFURAN	1	0	0	1	0	0	.	.	.
CICP	1	0	0	1	0	0	.	.	.
DIALLATE	1	0	0	1	0	0	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	1	0	0	1	0	0	.	.	.
IPC	1	0	0	1	0	0	.	.	.
PROPOXUR	1	0	0	1	0	0	.	.	.
CARBARYL	1	0	0	1	0	0	.	.	.
BUTYLATE	1	0	0	1	0	0	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	28	0	0	28	0	0	2	0	0
VOLATILES									
BENZENE	4	0	1	4	0	0	2	0	0
TOLUENE	4	0	2	4	0	3	2	0	1
ETHYLBENZENE	4	0	3	4	0	2	2	0	0
P-XYLENE	4	0	0	4	0	0	2	0	0
M-XYLENE	4	0	1	4	0	0	2	0	0
O-XYLENE	4	0	1	4	0	0	2	0	0
STYRENE	4	0	2	4	0	0	2	0	0
1,1 DICHLOROETHYLENE	4	0	0	4	0	0	2	0	0
METHYLENE CHLORIDE	4	0	0	4	0	0	2	0	0
T1,2DICHLOROETHYLENE	4	0	0	4	0	0	2	0	0
1,1 DICHLOROETHANE	4	0	0	4	0	0	2	0	0
CHLOROFORM	4	4	0	4	4	0	2	2	0
111, TRICHLOROETHANE	4	0	0	4	0	0	2	0	0
1,2 DICHLOROETHANE	4	0	0	4	0	0	2	0	0
CARBON TETRACHLORIDE	4	0	0	4	0	0	2	0	0
1,2 DICHLOROPROPANE	4	0	0	4	0	0	2	0	0
TRICHLOROETHYLENE	4	0	0	4	0	0	2	0	0
DICHLOROBROMOMETHANE	4	4	0	4	4	0	2	2	0
112 TRICHLOROETHANE	4	0	0	4	0	0	2	0	0
CHLORODIBROMOMETHANE	4	4	0	4	4	0	2	2	0
T-CHLOROETHYLENE	4	0	0	4	0	0	2	0	0
BROMOFORM	4	0	3	4	0	3	2	0	1
1122 T-CHLOROETHANE	4	0	0	4	0	0	2	0	0
CHLOROBENZENE	4	0	0	4	0	0	2	0	0
1,4 DICHLOROBENZENE	4	0	0	4	0	0	2	0	2
1,3 DICHLOROBENZENE	4	0	0	4	0	0	2	0	0
1,2 DICHLOROBENZENE	4	0	0	4	0	0	2	0	0
ETHLYENE DIBROMIDE	4	0	0	4	0	0	2	0	0
TOTL TRIHALOMETHANES	4	4	0	4	4	0	2	2	0
*TOTAL SCAN VOLATILES	116	16	13	116	16	8	58	8	4
*TOTAL GROUP ORGANIC	415	17	18	398	16	15	148	8	6

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminate Interference
XP	Positive After X Number Of Hours
T# (T06)	Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
STANDRD PLATE CNT	BACTERIOLOGICAL MF (COUNT/ML)	DET'N LIMIT = 0		GUIDELINE = 500/ML (A3)
SEP	.	0 <=>	.	2 <=>
OCT	.	1 <=>	.	.
NOV	.	10	.	.
DEC	.	0 <=>	.	1 <=>

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHEMISTRY (FLD)				
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A
SEP	.400	.200	.	.200
OCT	.	.400	.	.
NOV	.400	.250	.	.
DEC	.250	.200	.300	.300
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A
SEP	1.000	.500	.	.300
OCT	.700	.700	.	.
NOV	.600	.500	.	.
DEC	.500	.900	.400	.600
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A
SEP	1.400	.700	.	.500
OCT	.700	1.100	.	.
NOV	1.000	.750	.	.
DEC	.750	1.100	.700	.900
FLD PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)
SEP	7.800	7.400	.	7.500
OCT	8.000	7.400	.	.
NOV	7.800	7.600	.	.
DEC	7.800	7.000	7.200	7.200
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A	GUIDELINE = 15 (A3)
SEP	20.000	21.000	.	21.000
OCT	16.000	16.000	.	.
NOV	9.000	12.000	.	.
DEC	7.000	8.000	12.000	8.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A	GUIDELINE = 1 (A1)
SEP	3.300	.040	.	.500
OCT	1.600	.080	.	.
NOV	31.500	.200	.	.
DEC	53.000	.070	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHEMISTRY (LAB)				
ALKALINITY (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 30-500 (A3)
SEP	92.900	89.100	.	90.000
OCT	95.000	85.100	.	.
NOV	99.200	82.900	.	.
DEC	98.800	82.200	83.800	83.600
CALCIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 100 (F2)
SEP	36.100	37.300	.	38.200
OCT	37.700	37.200	.	.
NOV	35.600	35.400	.	.
DEC	40.000	40.600	37.400	36.800
CHLORIDE (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 250 (A3)
SEP	17.900	19.500	.	20.200
OCT	16.600	17.300	.	.
NOV	15.900	15.400	.	.
DEC	16.700	16.300	17.100	17.100
COLOUR (HZU)			DET'N LIMIT = 0.5	GUIDELINE = 5 (A3)
SEP	1.000 <T	1.000 <T	.	1.000 <T
OCT	.500 <T	.500 <T	.	.
NOV	1.500 <T	BDL	.	.
DEC	BDL	1.000 <T	1.000 <T	1.000 <T
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.	GUIDELINE = 400 (F2)
SEP	289	308	.	311
OCT	287	293	.	.
NOV	295	309	.	.
DEC	294	302	309	310
DISS ORG CARBON (MG/L)			DET'N LIMIT = .100	GUIDELINE = 5.0 (A3)
SEP	2.000	1.600	.	1.700
OCT	2.100	1.400	.	.
NOV	2.100	1.500	.	.
DEC	2.200	1.300	1.400	1.300
FLUORIDE (MG/L)			DET'N LIMIT = 0.01	GUIDELINE = 2.4 (A1)
SEP	.100	.100	.	.100
OCT	.120	.100	.	.
NOV	.060	.080	.	.
DEC	.120	.080	.080	.080
HARDNESS (MG/L)			DET'N LIMIT = 0.5	GUIDELINE = 80-100 (A4)
SEP	127.100	131.500	.	133.900
OCT	130.500	128.700	.	.
NOV	128.000	126.000	.	.
DEC	140.800	139.800	128.000	127.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
IONCAL (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A
SEP	1.185	.650	.	1.044
OCT	2.221	.294	.	.
NOV	.123	2.320	.	.
DEC	5.966	5.328	3.765	4.183
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A
SEP	.261	.139	.	.194
OCT	.300	.034	.	.
NOV	.331	.085	.	.
DEC	.440	.244	.074	.056
MAGNESIUM (MG/L)			DET'N LIMIT = 0.1	GUIDELINE = 30 (F2)
SEP	9.000	9.350	.	9.350
OCT	8.850	8.700	.	.
NOV	9.500	9.200	.	.
DEC	9.950	9.350	8.300	8.500
SODIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 200 (A4)
SEP	8.600	10.000	.	10.300
OCT	7.500	7.400	.	.
NOV	8.800	8.800	.	.
DEC	7.900	7.700	8.800	8.800
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = 0.05 (F2)
SEP	BDL	BDL	.	BDL
OCT	.008 <T	.012	.	.
NOV	BDL	.008 <T	.	.
DEC	BDL	BDL	.004 <T	.002 <T
NITRITE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = 1 (A1)
SEP	.003 <T	.002 <T	.	.001 <T
OCT	BDL	BDL	.	.
NOV	.008	.002 <T	.	.
DEC	.017	BDL	BDL	BDL
TOTAL NITRATES (MG/L)			DET'N LIMIT = 0.005	GUIDELINE = 10 (A1)
SEP	.200	.220	.	.225
OCT	.215	.220	.	.
NOV	.240	.240	.	.
DEC	.355	.320	.320	.320
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A
SEP	.170	.130	.	.150
OCT	.290	.190	.	.
NOV	.300	.130	.	.
DEC	.300	.130	.090 <T	.090 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
PH (DIMNSLESS)			**DET'N LIMIT = N/A**	**GUIDELINE = 6.5-8.5(A4)**
SEP	8.170	8.060	.	8.100
OCT	8.180	7.970	.	.
NOV	8.220	8.060	.	.
DEC	8.280	8.160	8.020	8.010
PHOSPHORUS FIL REACT (MG/L)			**DET'N LIMIT = 0.0005**	**GUIDELINE = N/A**
SEP	.005	BDL	.	.
OCT	.004	.000 <T	.	.
NOV	.020	BDL	.	.
DEC	.049	BDL	.	.
PHOSPHORUS TOTAL (MG/L)			**DET'N LIMIT = 0.002**	**GUIDELINE = .40 (F2)**
SEP	.008 <T	BDL	.	.
OCT	.013	.008 <T	.	.
NOV	.043	.002 <T	.	.
DEC	.068	BDL	.	.
SULPHATE (MG/L)			**DET'N LIMIT = .200**	**GUIDELINE = 500 (A3)**
SEP	24.250	33.550	.	33.900
OCT	23.490	33.540	.	.
NOV	23.430	41.550	.	.
DEC	24.400	40.600	41.400	41.500
TURBIDITY (FTU)			**DET'N LIMIT = 0.05**	**GUIDELINE = 1 (A1)**
SEP	2.800	.310	.	.300
OCT	1.400	.210 <T	.	.
NOV	31.000	.340	.	.
DEC	53.000	.250	.690	.930

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
METALS				
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)
SEP	45.000	140.000	.	130.000
OCT	31.000	67.000	.	.
NOV	230.000	49.000	.	.
DEC	500.000	29.000	18.000	20.000
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)
SEP	.690 <T	BDL	.	BDL
OCT	.830 <T	.370 <T	.	.
NOV	.930 <T	.330 <T	.	.
DEC	.730 <T	.130 <T	.130 <T	BDL
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)
SEP	22.000	21.000	.	21.000
OCT	21.000	21.000	.	.
NOV	25.000	21.000	.	.
DEC	30.000	21.000	22.000	22.000
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)
SEP	34.000	28.000	.	35.000
OCT	27.000	25.000	.	.
NOV	22.000	22.000	.	.
DEC	27.000	35.000	32.000	27.000
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)
SEP	BDL	BDL	.	BDL
OCT	BDL	BDL	.	.
NOV	BDL	BDL	.	.
DEC	BDL	BDL	.070 <T	BDL
CADMIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)
SEP	BDL	BDL	.	BDL
OCT	.070 <T	BDL	.	.
NOV	BDL	BDL	.	.
DEC	BDL	BDL	BDL	BDL
COBALT (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A
SEP	.080 <T	BDL	.	BDL
OCT	.110 <T	.100 <T	.	.
NOV	.370 <T	.140 <T	.	.
DEC	.570 <T	.120 <T	.100 <T	.090 <T
CHROMIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)
SEP	2.500 <T	1.500 <T	.	2.900 <T
OCT	2.300 <T	2.100 <T	.	.
NOV	.600 <T	1.700 <T	.	.
DEC	1.700 <T	4.300 <T	3.300 <T	2.300 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
COPPER (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)
SEP	3.500 <T	1.700 <T	.	3.200 <T
OCT	3.500 <T	1.300 <T	.	.
NOV	2.700 <T	1.300 <T	.	.
DEC	3.800 <T	1.800 <T	4.600 <T	1.900 <T
IRON (UG/L)			DET'N LIMIT = 6.00	GUIDELINE = 300 (A3)
SEP	55.000 <T	BDL	.	BDL
OCT	29.000 <T	BDL	.	.
NOV	320.000	BDL	.	.
DEC	720.000	7.500 <T	11.000 <T	7.300 <T
MERCURY (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 1 (A1)
SEP	BDL	BDL	.	.
OCT	.060 <T	.080 <T	.	.
NOV	BDL	.090 <T	.	.
DEC	BDL	BDL	.	.
MANGANESE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A3)
SEP	7.300	.970	.	.790
OCT	2.200	1.600	.	.
NOV	18.000	2.400	.	.
DEC	34.000	1.300	1.300	1.600
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A
SEP	1.100	1.300	.	1.100
OCT	1.200	1.300	.	.
NOV	.580	1.200	.	.
DEC	.560	1.200	1.400	1.400
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)
SEP	BDL	BDL	.	BDL
OCT	.910 <T	.760 <T	.	.
NOV	.890 <T	.430 <T	.	.
DEC	1.100 <T	BDL	BDL	BDL
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)
SEP	.210 <T	BDL	.	.280 <T
OCT	.460 <T	.070 <T	.	.
NOV	.560	.070 <T	.	.
DEC	1.000	BDL	.220 <T	.090 <T
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)
SEP	.590	.510	.	.480 <T
OCT	.510	.510	.	.
NOV	.490 <T	.480 <T	.	.
DEC	.440 <T	.510	.620	.520

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM		
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
SELENIUM (UG/L)			**DET'N LIMIT = 1.00**	**GUIDELINE = 10 (A1)**	
SEP	1.300 <T	1.600 <T	.	1.600 <T	
OCT	1.200 <T	BDL	.	.	
NOV	1.200 <T	BDL	.	.	
DEC	1.800 <T	1.600 <T	1.800 <T	2.100 <T	
STRONTIUM (UG/L)			**DET'N LIMIT = 0.10**	**GUIDELINE = N/A**	
SEP	180.000	210.000	.	220.000	
OCT	160.000	160.000	.	.	
NOV	170.000	170.000	.	.	
DEC	200.000	180.000	190.000	190.000	
TITANIUM (UG/L)			**DET'N LIMIT = 0.50**	**GUIDELINE = N/A**	
SEP	4.800 <T	2.800 <T	.	3.000 <T	
OCT	3.200 <T	2.100 <T	.	.	
NOV	7.000	2.400 <T	.	.	
DEC	8.100	2.100 <T	1.900 <T	1.800 <T	
URANIUM (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 100 (A1)**	
SEP	.310 <T	.250 <T	.	.210 <T	
OCT	.360 <T	.150 <T	.	.	
NOV	.370 <T	.150 <T	.	.	
DEC	.450 <T	.130 <T	.100 <T	.130 <T	
VANADIUM (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = N/A**	
SEP	.310 <T	.830	.	.860	
OCT	.290 <T	.920	.	.	
NOV	.760	1.100	.	.	
DEC	1.300	1.400	.980	.900	
ZINC (UG/L)			**DET'N LIMIT = 0.20**	**GUIDELINE = 5000 (A3)**	
SEP	2.900	1.800 <T	.	2.300	
OCT	2.600	1.500 <T	.	.	
NOV	5.100	4.400	.	.	
DEC	6.500	2.900	5.800	.940 <T	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHLOROAROMATICS				
HEXACHLOROETHANE (NG/L)		DET'N LIMIT = 1.000		GUIDELINE = 1900 (D4)
SEP	BDL	BDL	.	BDL
OCT	BDL	BDL	.	.
NOV	BDL	BDL	.	.
DEC	BDL	6.000 <T	.	5.000 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
PESTICIDES & PCB				
ALPHA BHC (NG/L)			**DET'N LIMIT = 1.000**	**GUIDELINE = 700 (G)**
SEP	1.000 <T	BDL	.	BDL
OCT	BDL	BDL	.	.
NOV	1.000 <T	1.000 <T	.	.
DEC	BDL	1.000 <T	.	1.000 <T
ATRAZINE (NG/L)			**DET'N LIMIT = 50**	**GUIDELINE = 60000 (A2)**
SEP	BDL	BDL	.	.
OCT	BDL	BDL	.	.
NOV	190.000 <T	150.000 <T	.	.
DEC	60.000 <T	160.000 <T	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM		
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
PHENOLICS (UG/L	PHENOLICS)		DET'N LIMIT = .2	GUIDELINE = 2	(A4)
SEP	1.000 <T	BDL	.	.	
OCT	BDL	.600 <T	.	.	
NOV	BDL	BDL	.	.	
DEC	1.000	.600 <T	.	.	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM		
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
VOLATILES					
BENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5	(A1)
SEP	BDL	BDL	.	BDL	
OCT	BDL	BDL	.	.	
NOV	.150 <T	BDL	.	.	
DEC	BDL	BDL	.	BDL	
TOLUENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 24	(A3)
SEP	BDL	.050 <T	.	.050 <T	
OCT	.050 <T	.150 <T	.	.	
NOV	.400 <T	.300 <T	.	.	
DEC	BDL	BDL	.	BDL	
ETHYLBENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 2.4	(A3)
SEP	BDL	BDL	.	BDL	
OCT	.050 <T	.100 <T	.	.	
NOV	.200 <T	.050 <T	.	.	
DEC	.100 <T	BDL	.	BDL	
M-XYLENE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 300	(A3*)
SEP	BDL	BDL	.	BDL	
OCT	BDL	BDL	.	.	
NOV	.200 <T	BDL	.	.	
DEC	BDL	BDL	.	BDL	
O-XYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 300	(A3*)
SEP	BDL	BDL	.	BDL	
OCT	BDL	BDL	.	.	
NOV	.100 <T	BDL	.	.	
DEC	BDL	BDL	.	BDL	
STYRENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100	(D1)
SEP	BDL	BDL	.	BDL	
OCT	BDL	BDL	.	.	
NOV	.150 <T	BDL	.	.	
DEC	.150 <T	BDL	.	BDL	
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350	(A1+)
SEP	22.800	23.900	.	24.100	
OCT	18.700	22.200	.	.	
NOV	19.500	16.400	.	.	
DEC	24.800	21.300	.	21.400	
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 350	(A1+)
SEP	11.300	12.700	.	12.350	
OCT	10.950	11.700	.	.	
NOV	11.250	10.750	.	.	
DEC	10.700	11.000	.	11.150	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DUNNVILLE WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHLORODIBROMOMETHANE (UG/L)			**DET'N LIMIT = 0.10**	**GUIDELINE = 350 (A1+)**
SEP	4.600	4.900	.	5.000
OCT	5.200	5.500	.	.
NOV	5.000	4.100	.	.
DEC	2.600	3.000	.	3.100
BROMOFORM (UG/L)			**DET'N LIMIT = 0.20**	**GUIDELINE = 350 (A1+)**
SEP	.400 <T	.400 <T	.	.400 <T
OCT	.600 <T	.600 <T	.	.
NOV	.400 <T	.400 <T	.	.
DEC	BDL	BDL	.	BDL
1,4 DICHLOROBENZENE (UG/L)			**DET'N LIMIT = 0.10**	**GUIDELINE = 5 (A1)**
SEP	BDL	BDL	.	.200 <T
OCT	BDL	BDL	.	.
NOV	BDL	BDL	.	.
DEC	BDL	BDL	.	.100 <T
TOTL TRIHALOMETHANES (UG/L)			**DET'N LIMIT = 0.50**	**GUIDELINE = 350 (A1)**
SEP	39.000	41.900	.	41.950
OCT	35.400	39.850	.	.
NOV	36.150	32.150	.	.
DEC	38.100	35.300	.	35.600

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10 0 (A1)
TURBIDITY	FTU	0.05	.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY
All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS
Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: P0C0D0 UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION:**NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled

Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)
Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)
Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top

<u>Steps:</u>

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.